Smart Sea Level Sensors for Coastal Resilience

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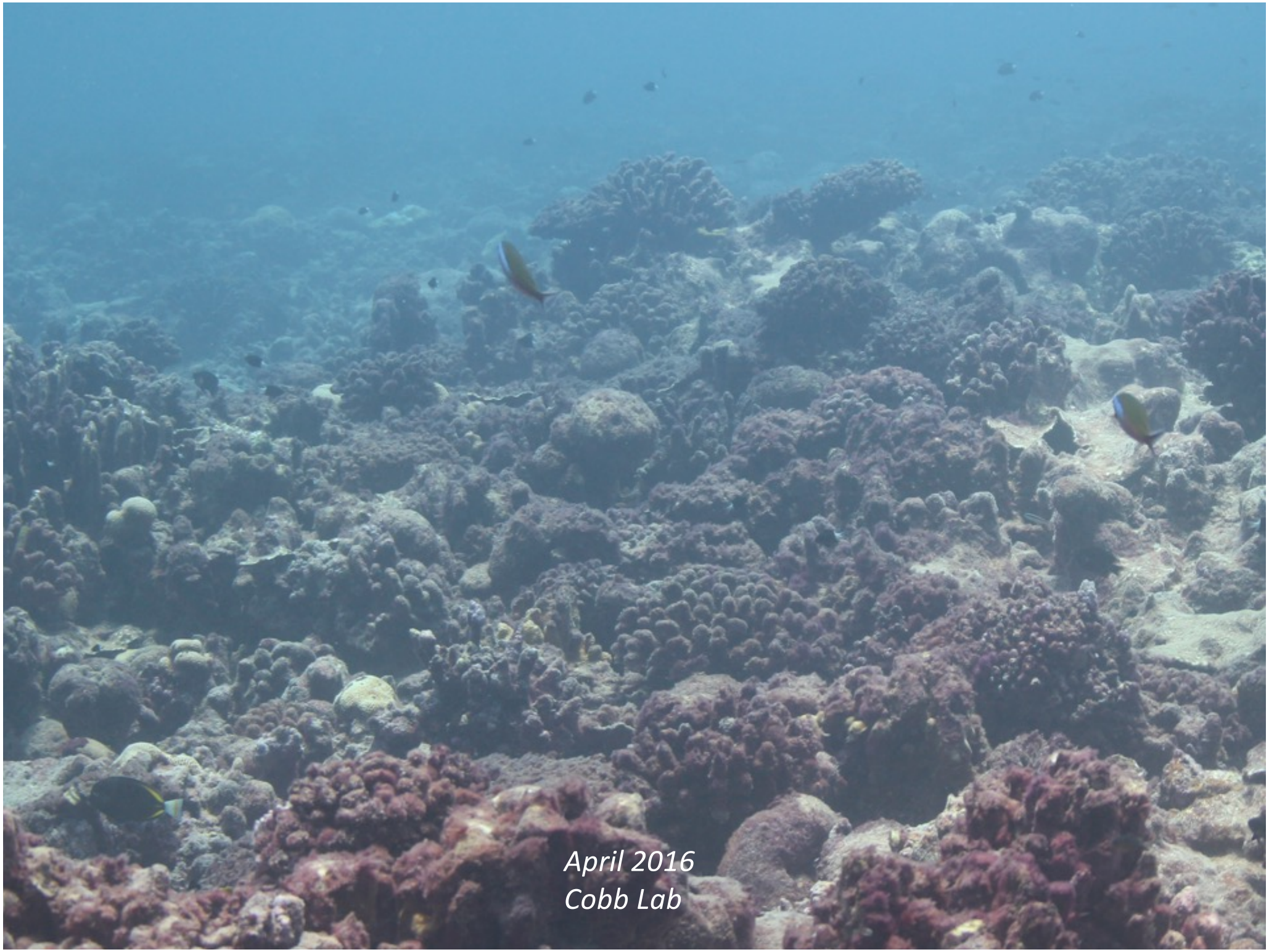
ADVANCE Professor

Source: goldenisles.com


Photo: Sean Compton, FOX5 Atlanta


October 27, 2019
photo: CA Dept Transportation/LA Times

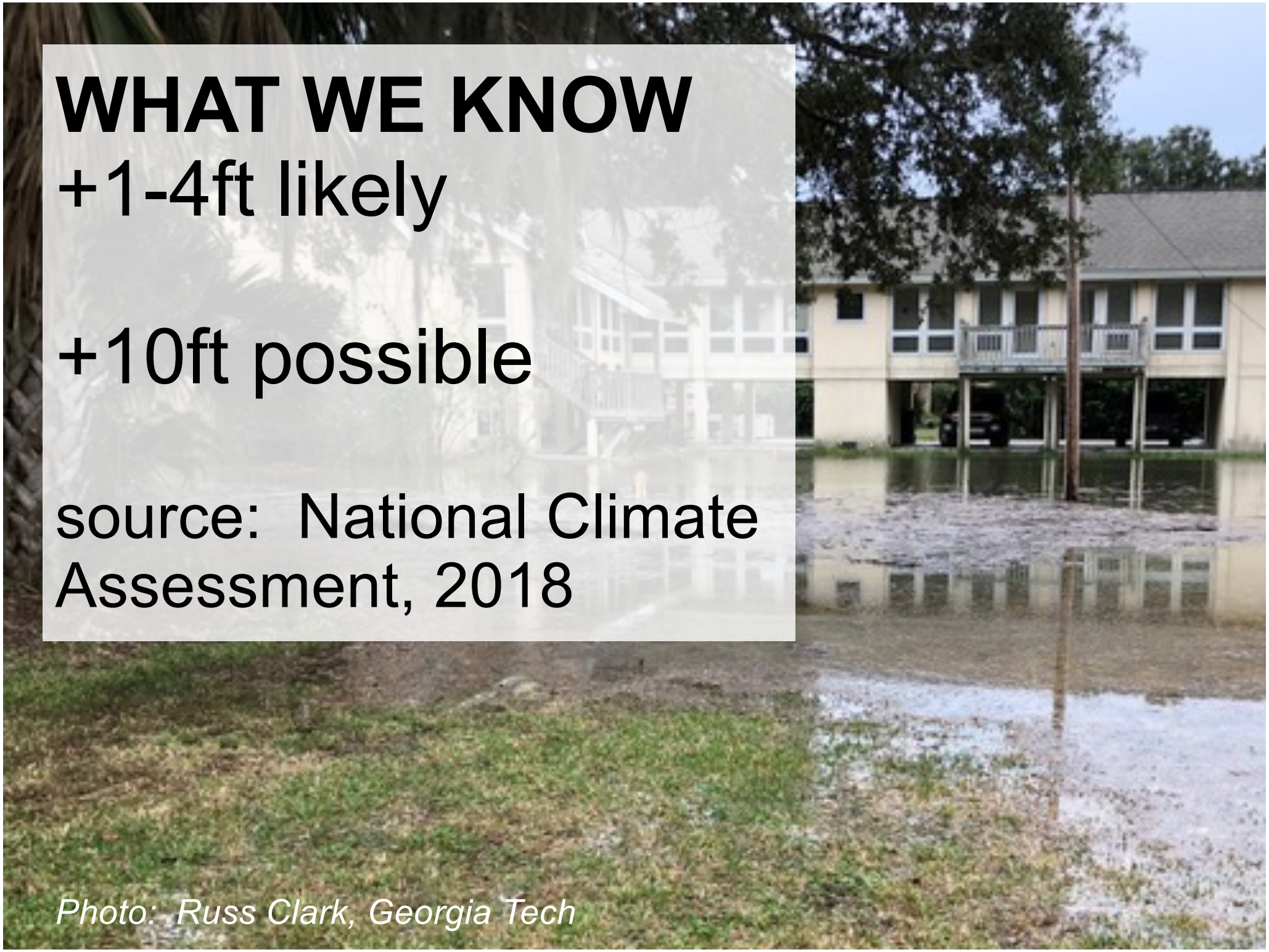
September 23, 2018
Photo: Joe Raedle/Getty Images


April 2016
Cobb Lab

The Climate Solutions Paradox

We know enough.

We know nothing.



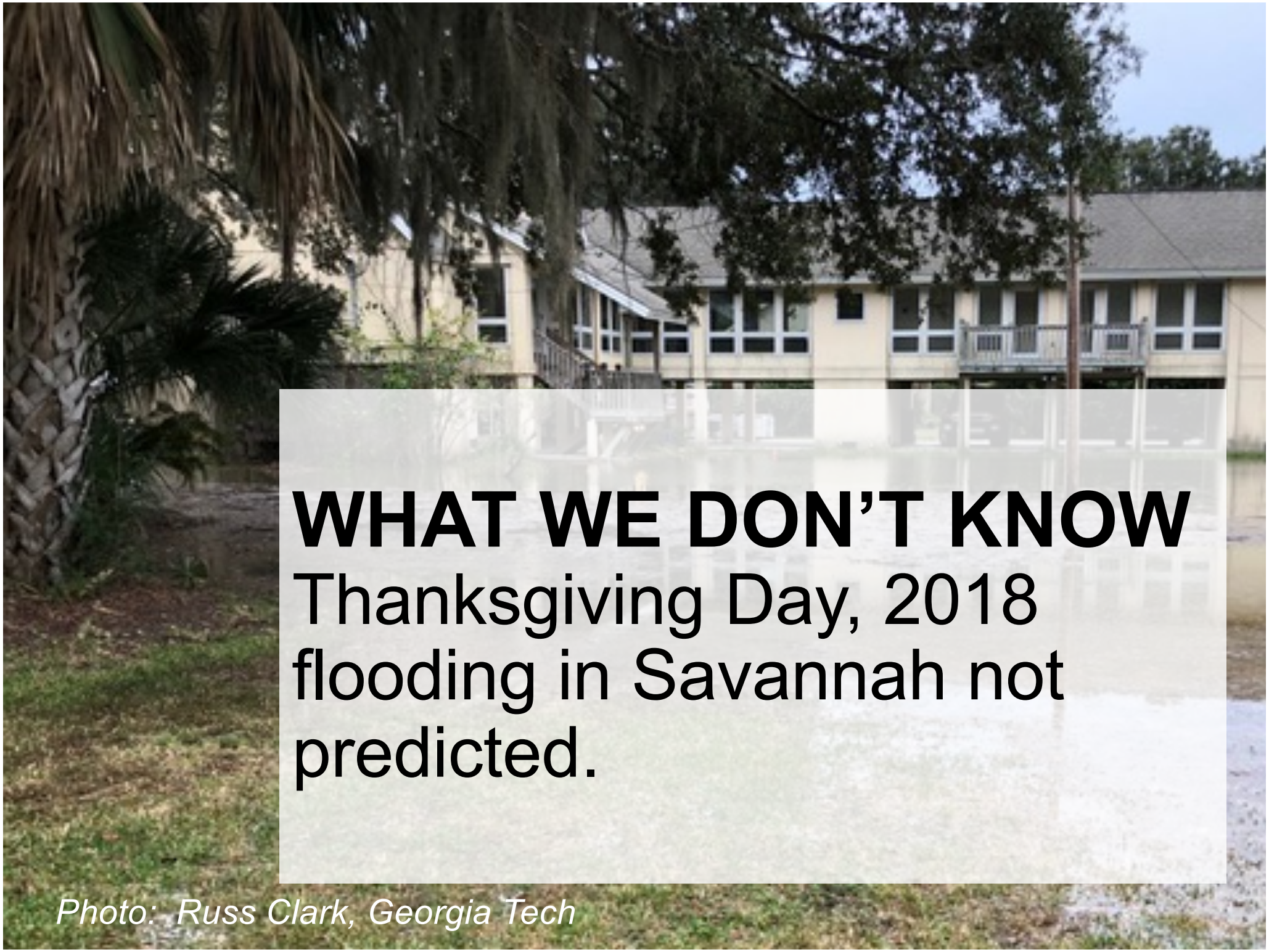
WHAT WE KNOW

+1-4ft likely

+10ft possible

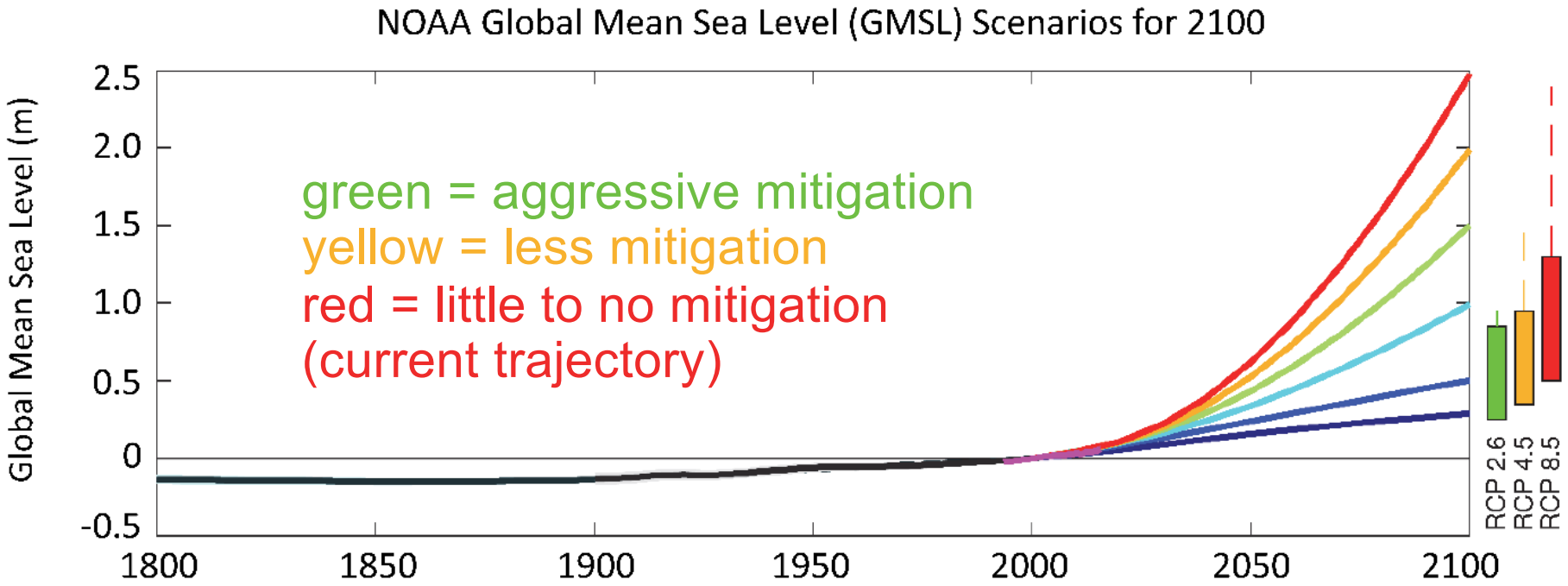
source: National Climate Assessment, 2018

Photo: Russ Clark, Georgia Tech


WHAT WE DON'T KNOW
Thanksgiving Day, 2018 flooding in Savannah not predicted.
Photo: Russ Clark, Georgia Tech


“Blue sky flooding”
Photo: Russ Clark, Georgia Tech

Global sea level rise scenarios

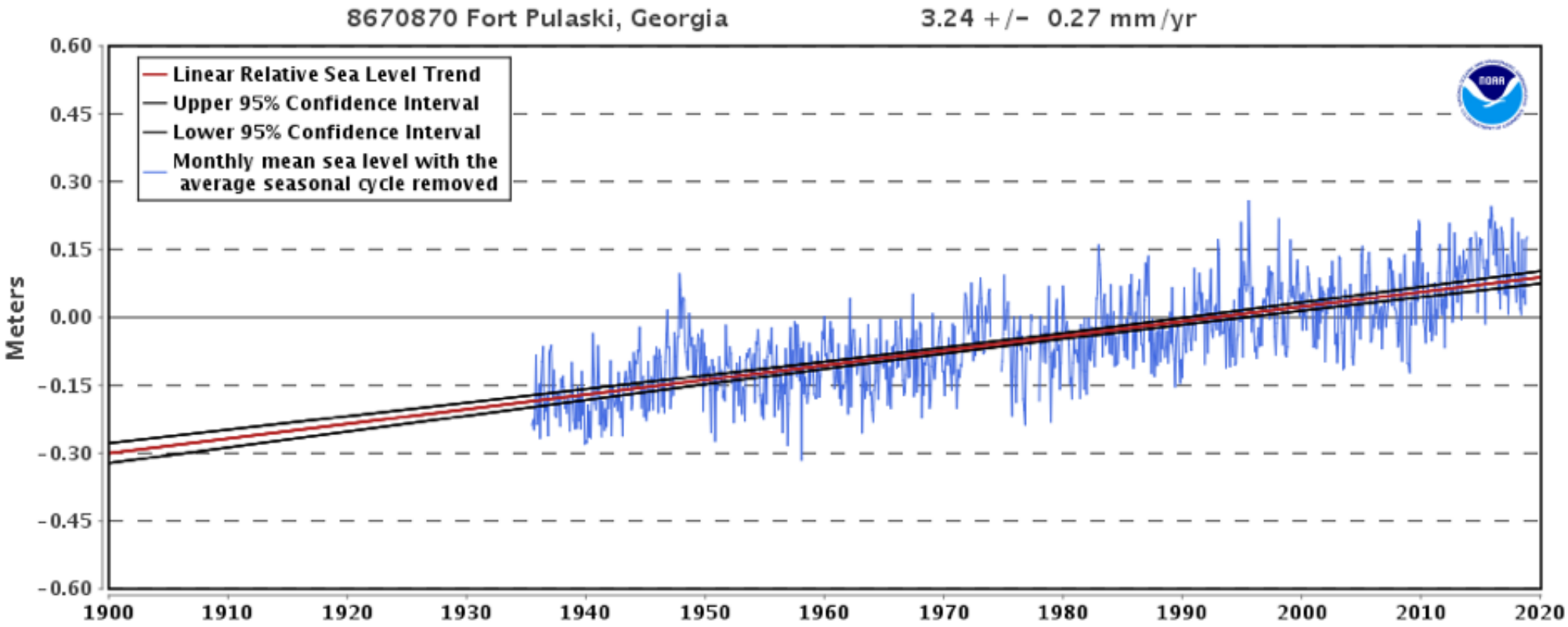


future sea level rise rates depend on:

1) our emissions pathway
2) response of the ice sheets to warming

Sweet et al., 2017
Fourth National Climate Assessment, 2018

Ft. Pulaski - Georgia's only NOAA tide gauge



local sea level has risen by +10" in 85yrs

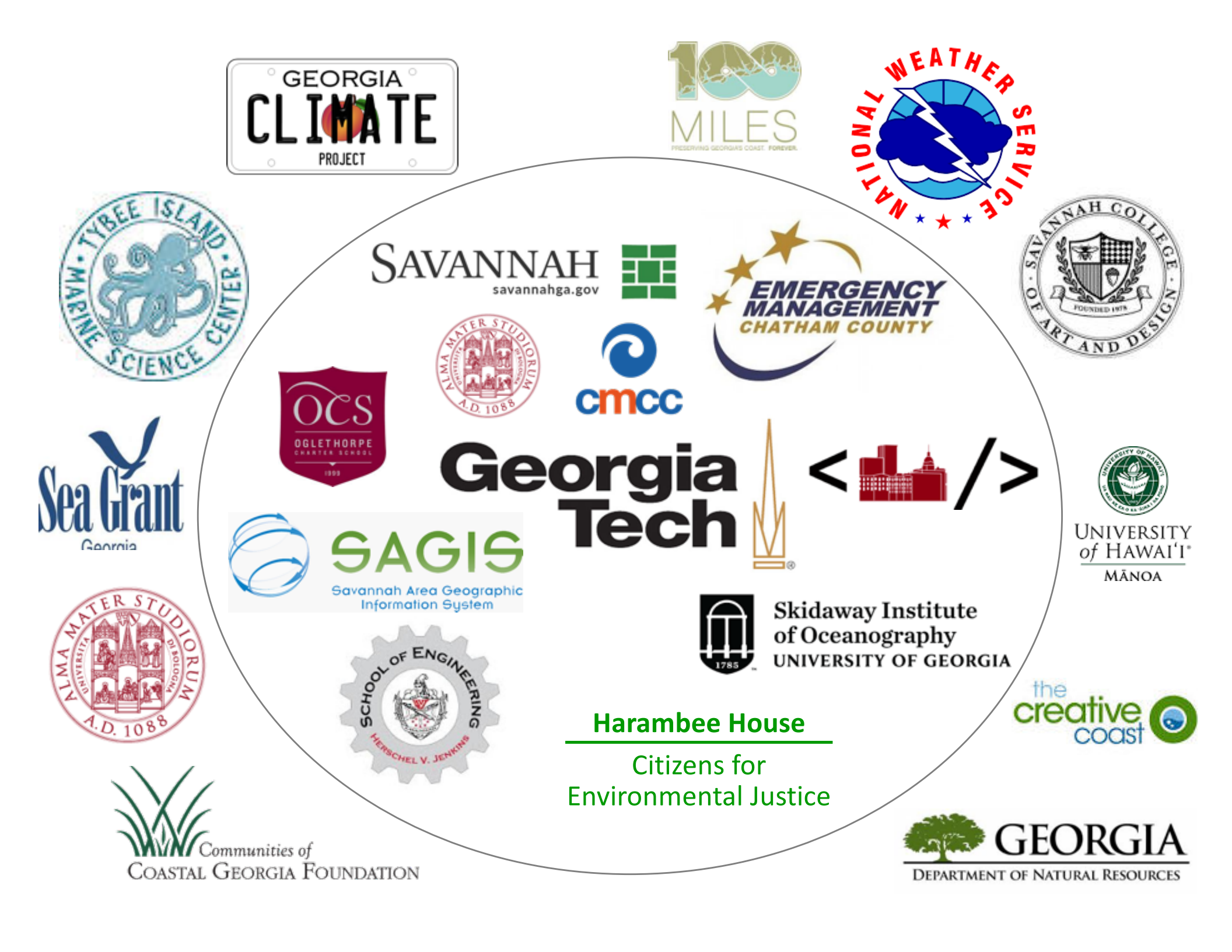
Georgia Tech

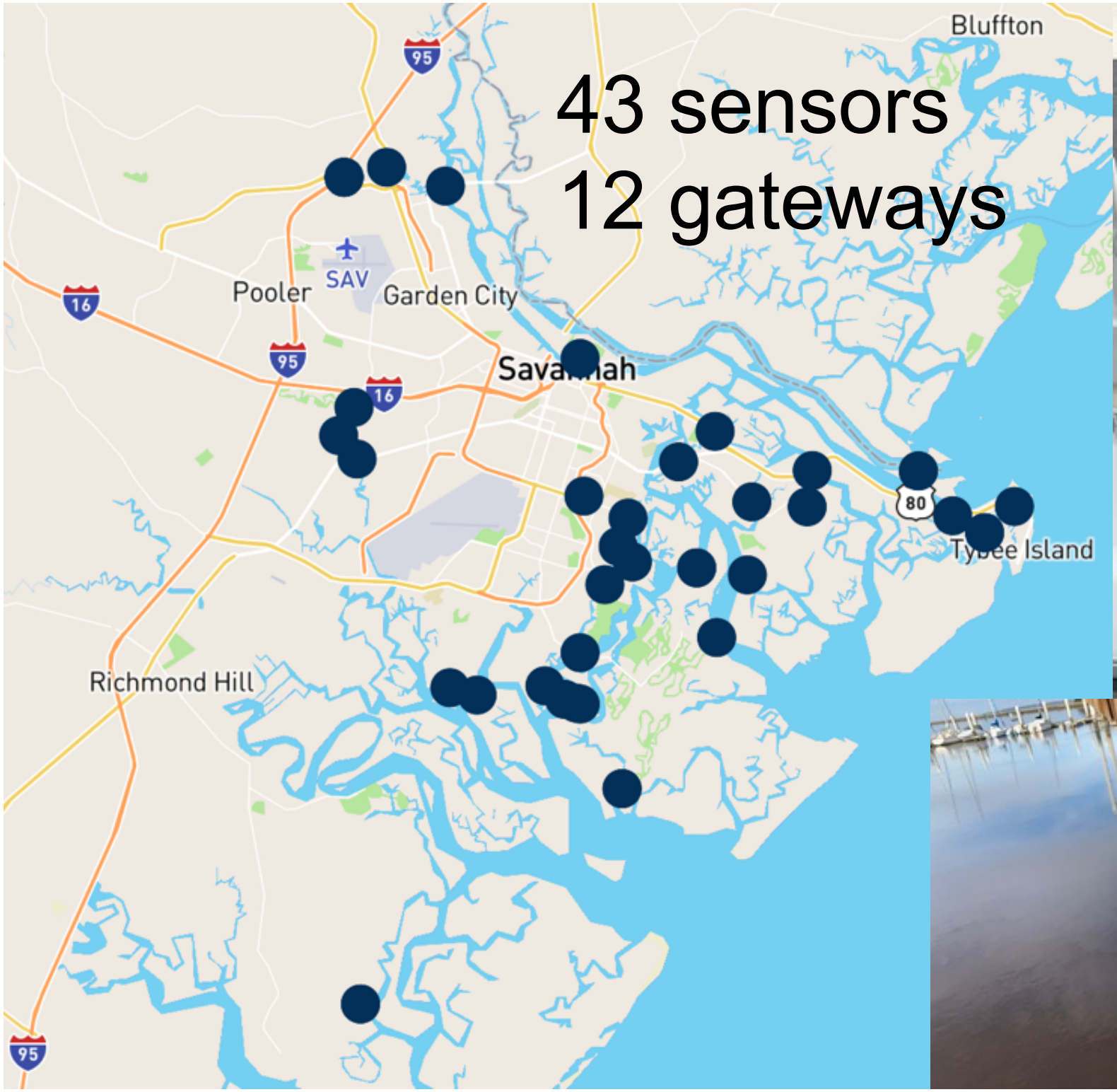
EMERGENCY MANAGEMENT CHATHAM COUNTY

SAVANNAH savannahga.gov

http://sealevelsensors.org

real-time data
hyperlocal forecasts
resilience planning tools
education & awareness


GEORGIA CLIMATE PROJECT
100 MILES
PRESERVING GEORGIA'S COAST. FOREVER.
NATIONAL WEATHER SERVICE
TYBEE ISLAND MARINE SCIENCE CENTER
SAVANNAH
savannahga.gov
SAVANNAH COLLEGE OF ART AND DESIGN
FOUNDED 1978
EMERGENCY MANAGEMENT
CHATHAM COUNTY
ALMA MATER STUDIORUM
A.D. 1088
cmcc
OCS
OGLETHORPE CHARTER SCHOOL
Georgia Tech
Sea Grant
Georgia
SAGIS
Savannah Area Geographic Information System
UNIVERSITY of HAWAI'I
MĀNOA
Skidaway Institute of Oceanography
UNIVERSITY OF GEORGIA
1785
SCHOOL OF ENGINEERING
HERSCHEL V. JENKINS
Harambee House
Citizens for Environmental Justice
the creative coast
Communities of
COASTAL GEORGIA FOUNDATION
GEORGIA
DEPARTMENT OF NATURAL RESOURCES


43 sensors
12 gateways
Bluffton
Pooler
SAV
Garden City
Savannah
Tybee Island
Richmond Hill
95
16
80

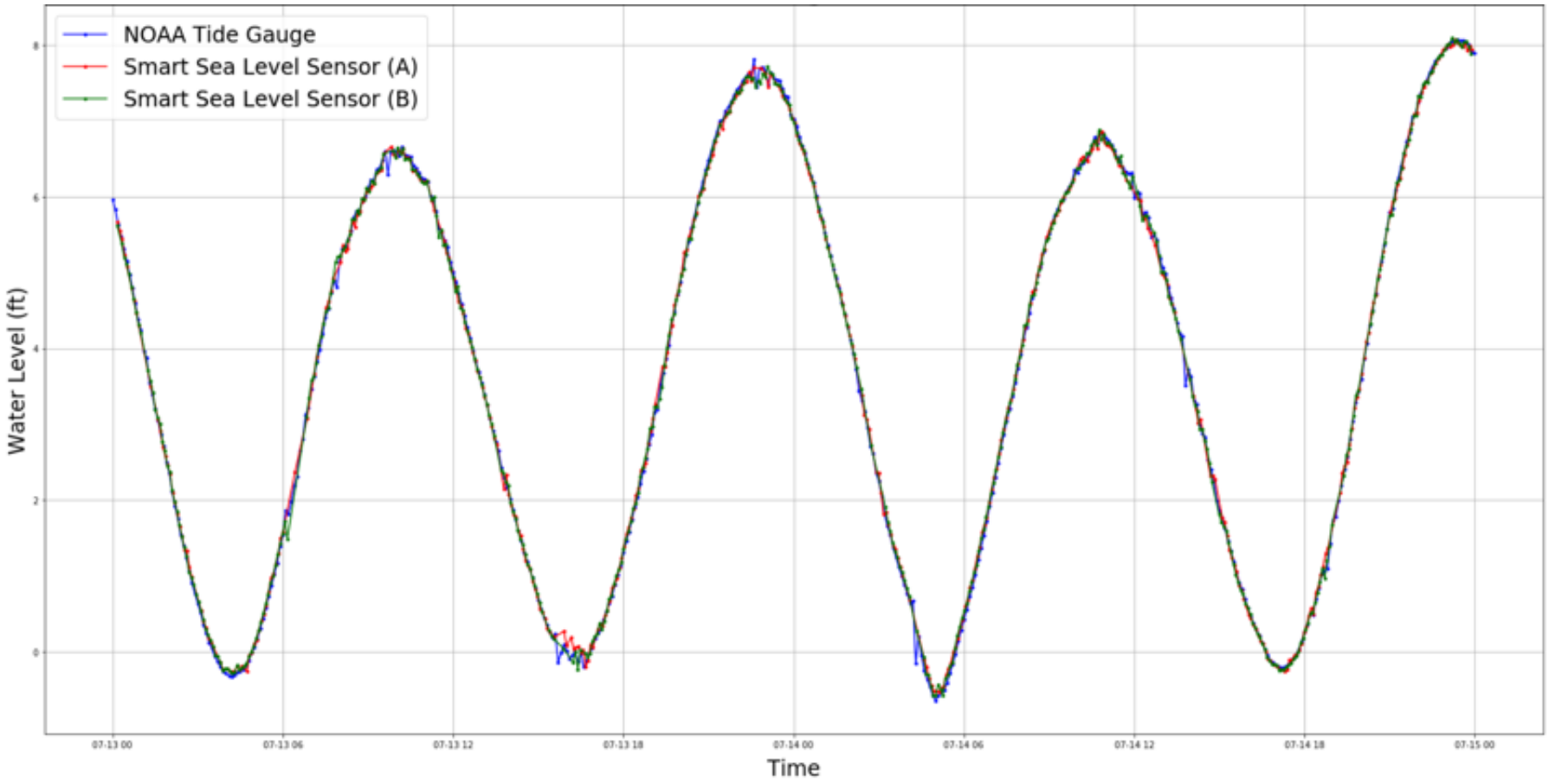
gateway device:
- roughly $1,500
- 1 to 4 mile range
- can serve hundreds of sensors
- needs internet, power

goal:
provide backbone for diverse IoT applications

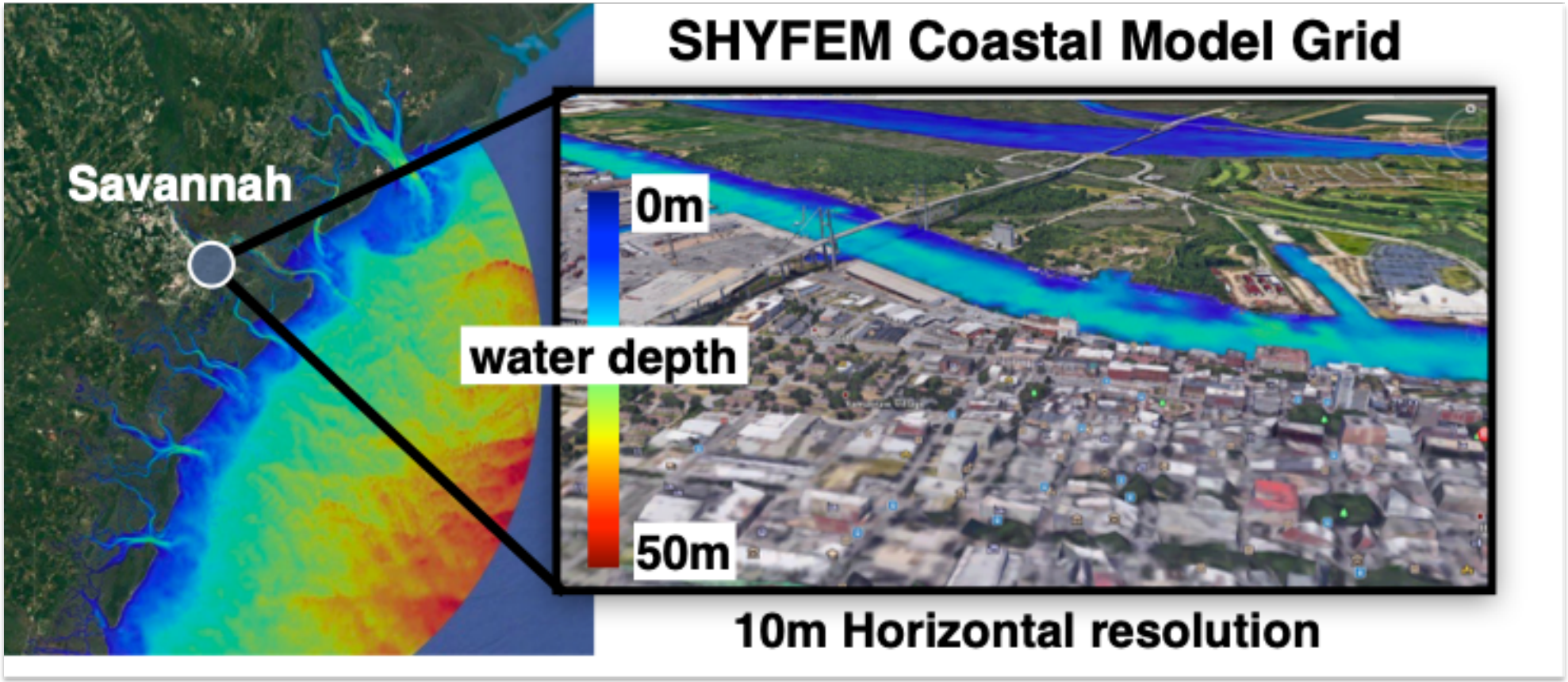
LoRa Alliance™
Wide Area Networks for IoT

THE THINGS NETWORK

Comparing two GT sensors with Ft. Pulaski NOAA gauge



average residuals between GT sensors and Ft. Pulaksi = less than 1”, maximum 6”



Where we are

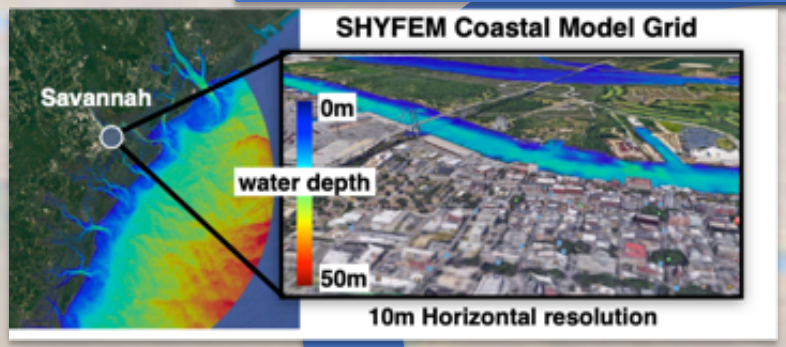
making 3-day forecasts with high-resolution ocean model, comparing with sensor data streams

Where we are going

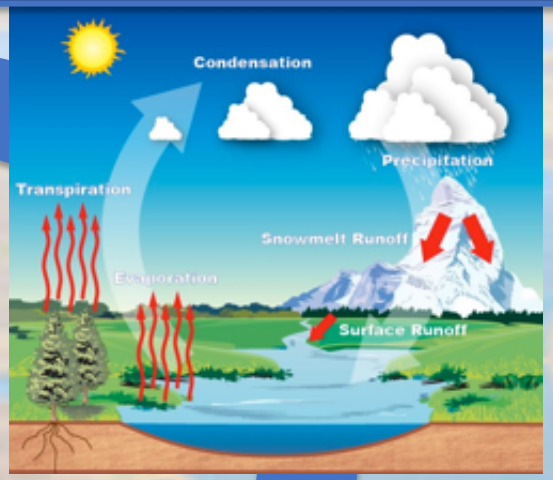
integrated forecasts of compound risk

decision support tools for planning

Coastal Water and Ocean Model



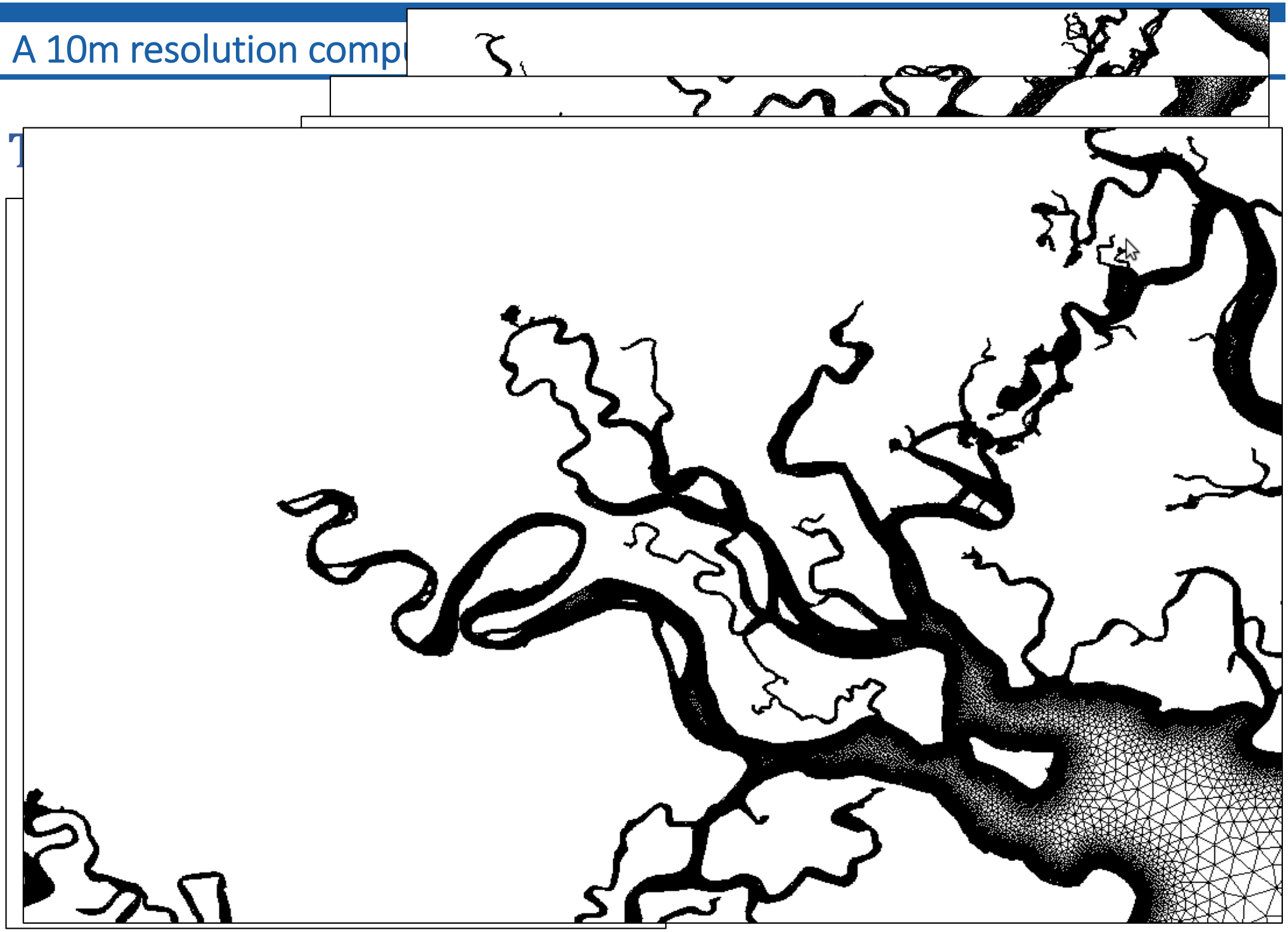
Regional Atmosphere & Land Hydrology Model



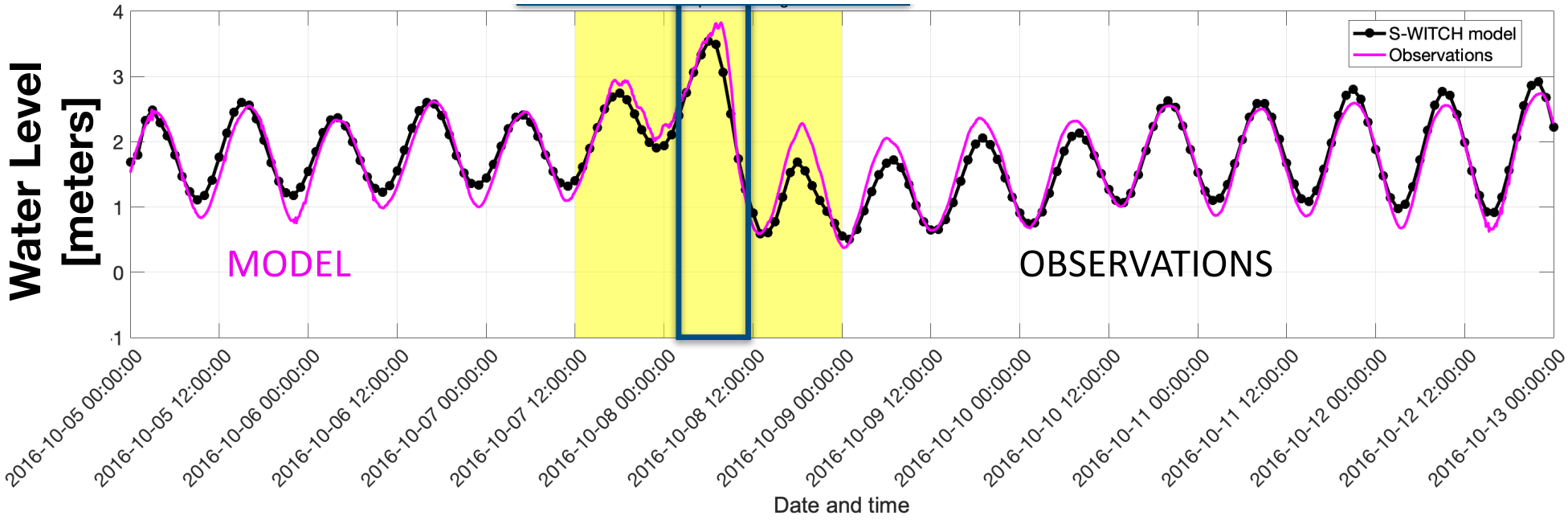
Urban Flooding Models with Infrastructure

Di Lorenzo, Pinardi et al

A 10m resolution compu



Model simulations of Hurricanes Matthew and Dorian reproduce observed flood levels to within 1ft



Transdisciplinary research
is messy

is not taught

is poorly funded

is the most promising
avenue for real-world
climate solutions

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is the most promising avenue for real-world climate solutions

ASK
LISTEN
ASK
LISTEN
ASK
LISTEN
DO
ASK
LISTEN
ASK
LISTEN
APOLOGIZE

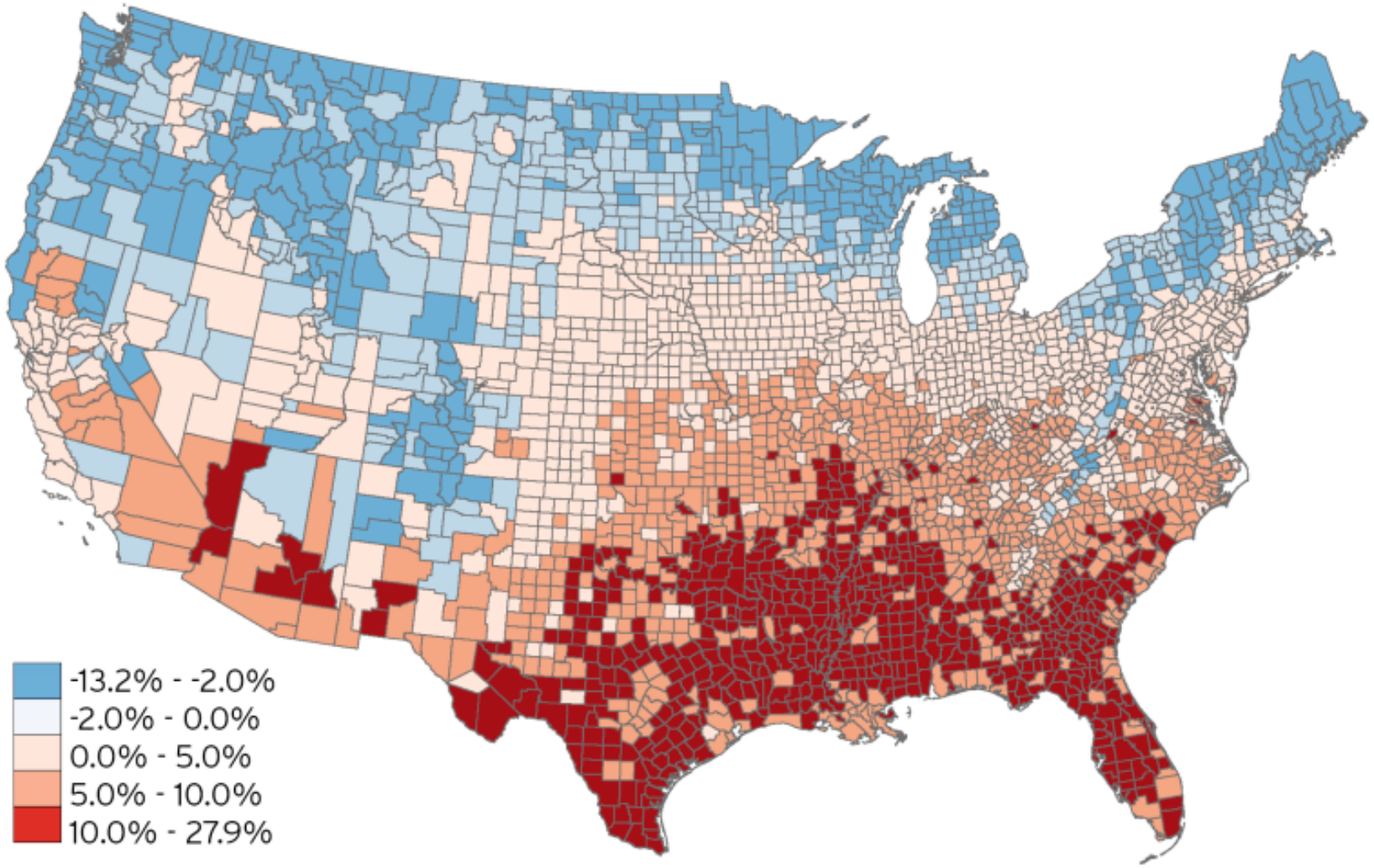
Who is not at the table?

MAP 2

Southeast in the bullseye of climate change impacts

Climate-related costs by 2080-2099

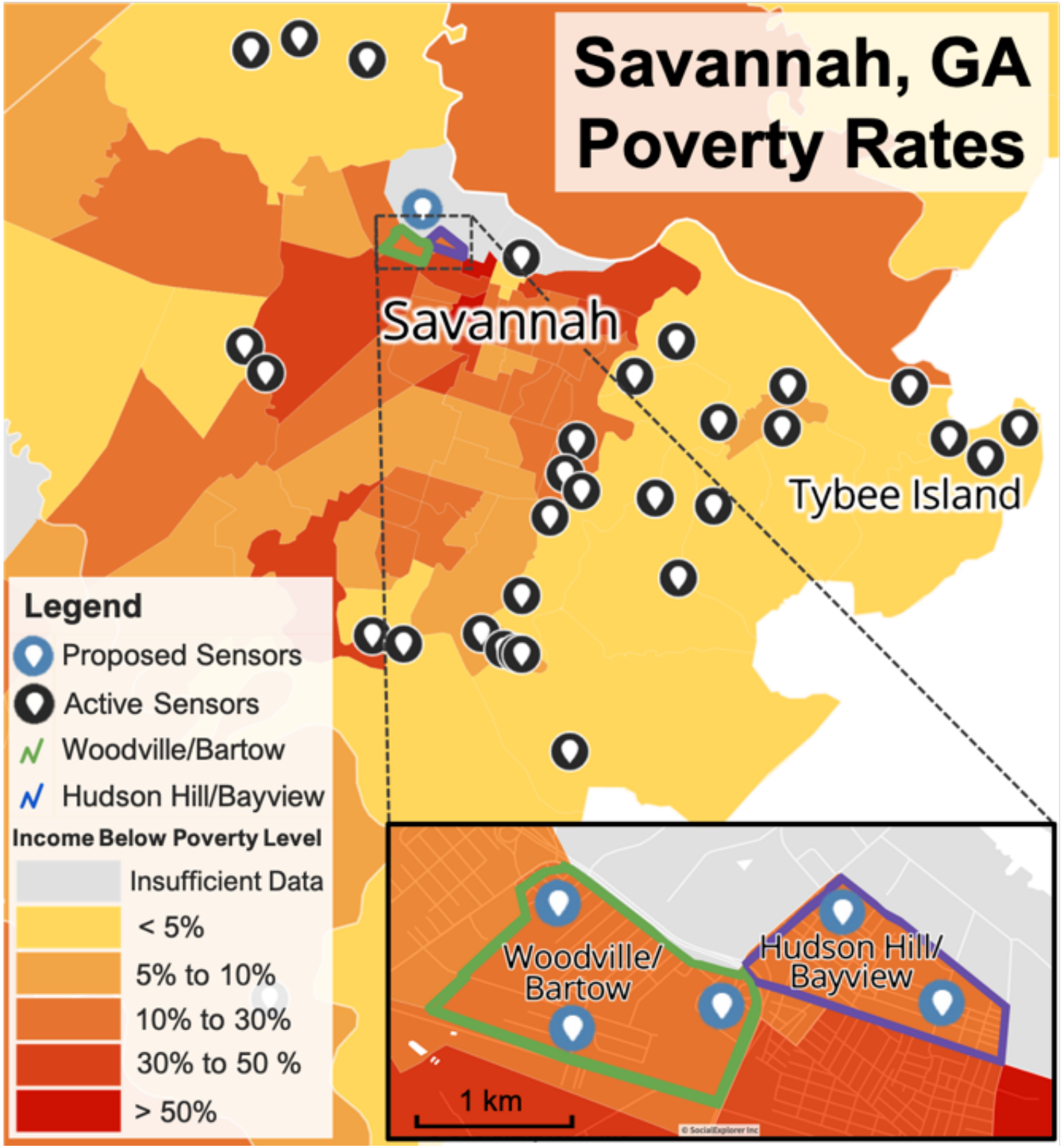
Share of 2012 county income



Note: Emissions projections are based on a "business-as-usual" scenario (RCP8.5), which reflects the current global trajectory

Source: Hsiang and others, 2017

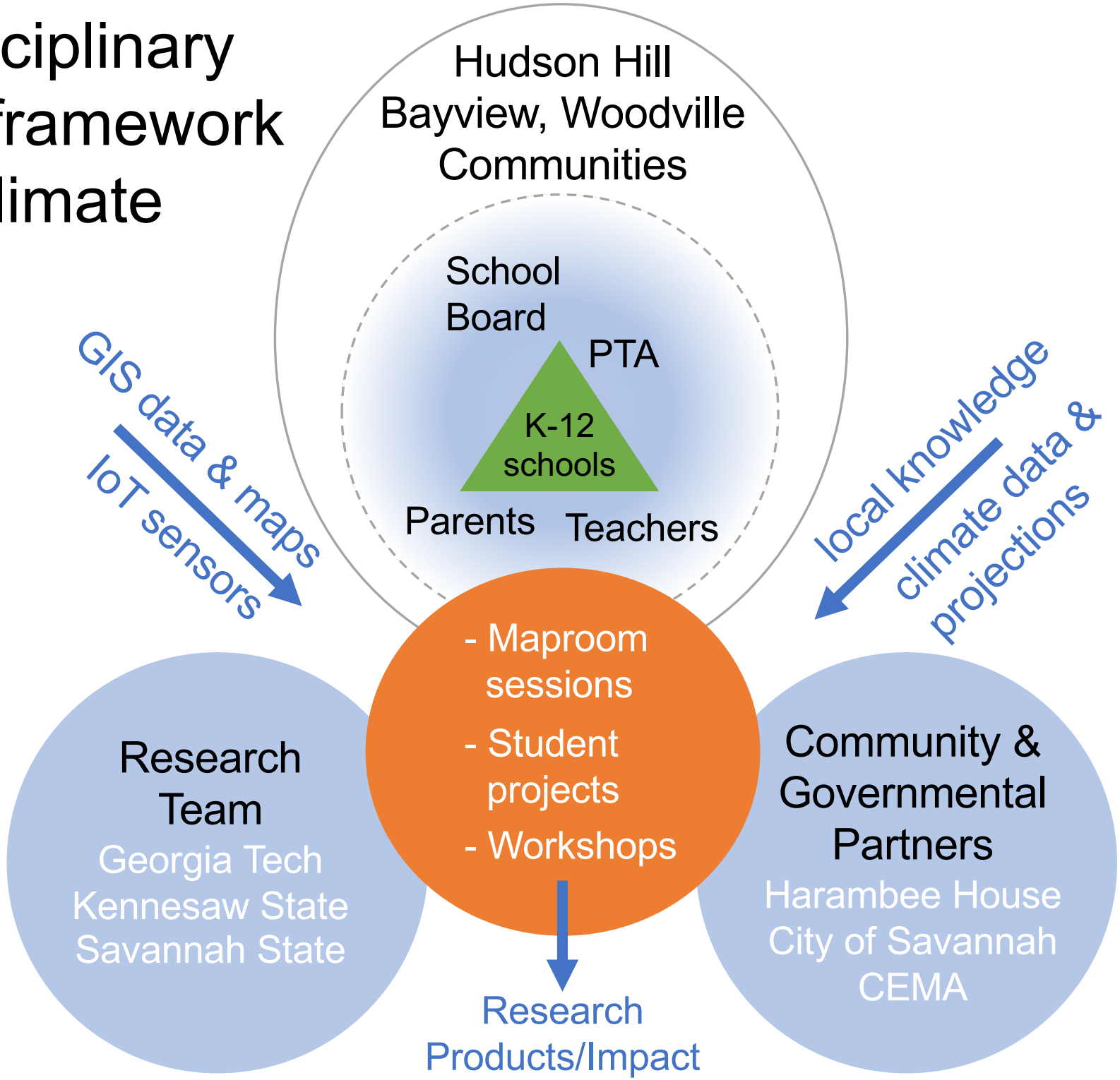
B | Metropolitan Policy Program at BROOKINGS



last 6 months
collaboration with Harambee House, local environmental justice org

targets
air quality, temperature, starting with K-12 schools

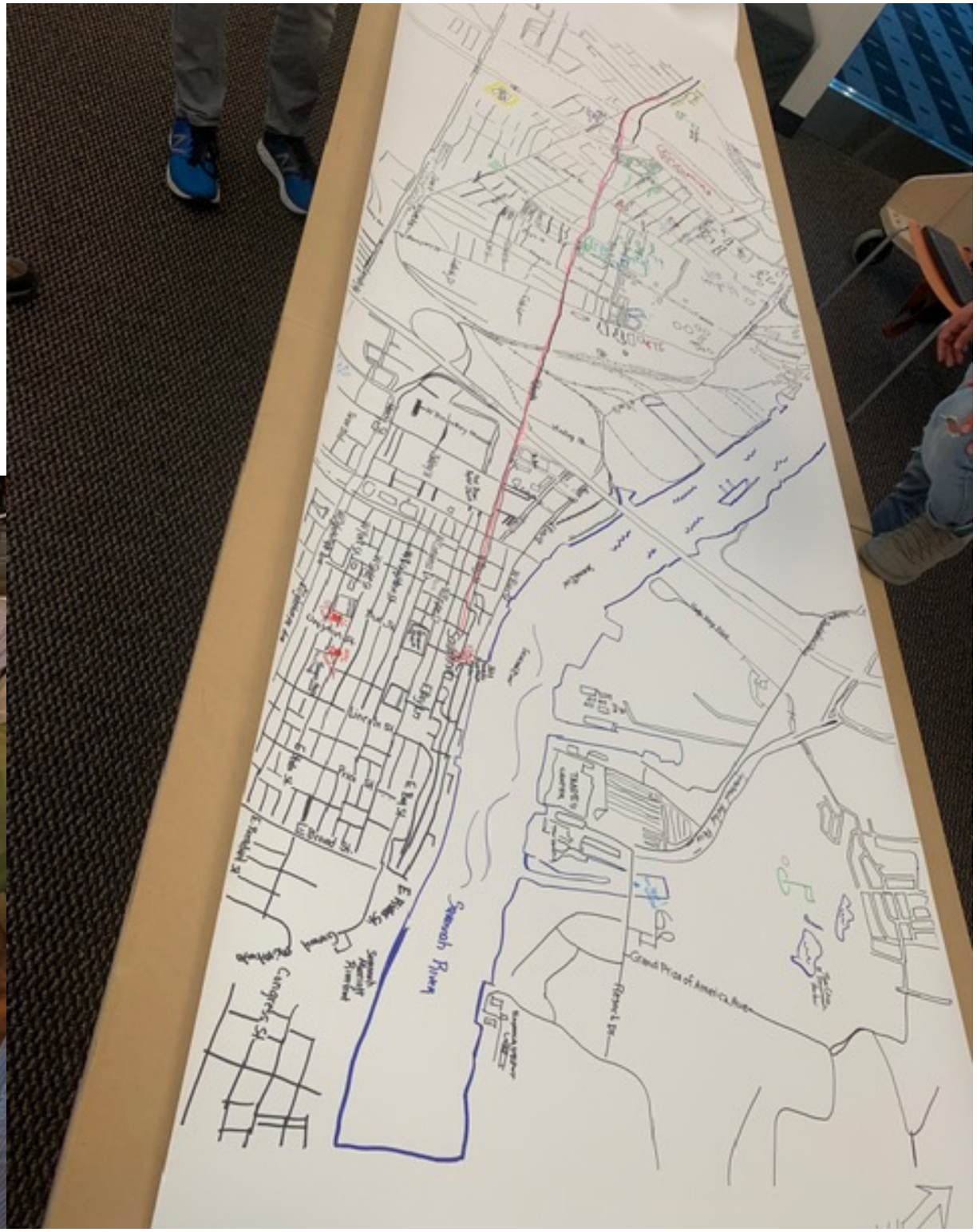
A transdisciplinary research framework for local climate solutions



”Map Room”

Yanni Loukissas
LMC, Georgia Tech

Nick Deffley
City of Savannah



Jenkins High School Partnership

- assemble and test 30 sea level sensors
- redesigned sensor housing
- curriculum written by the students

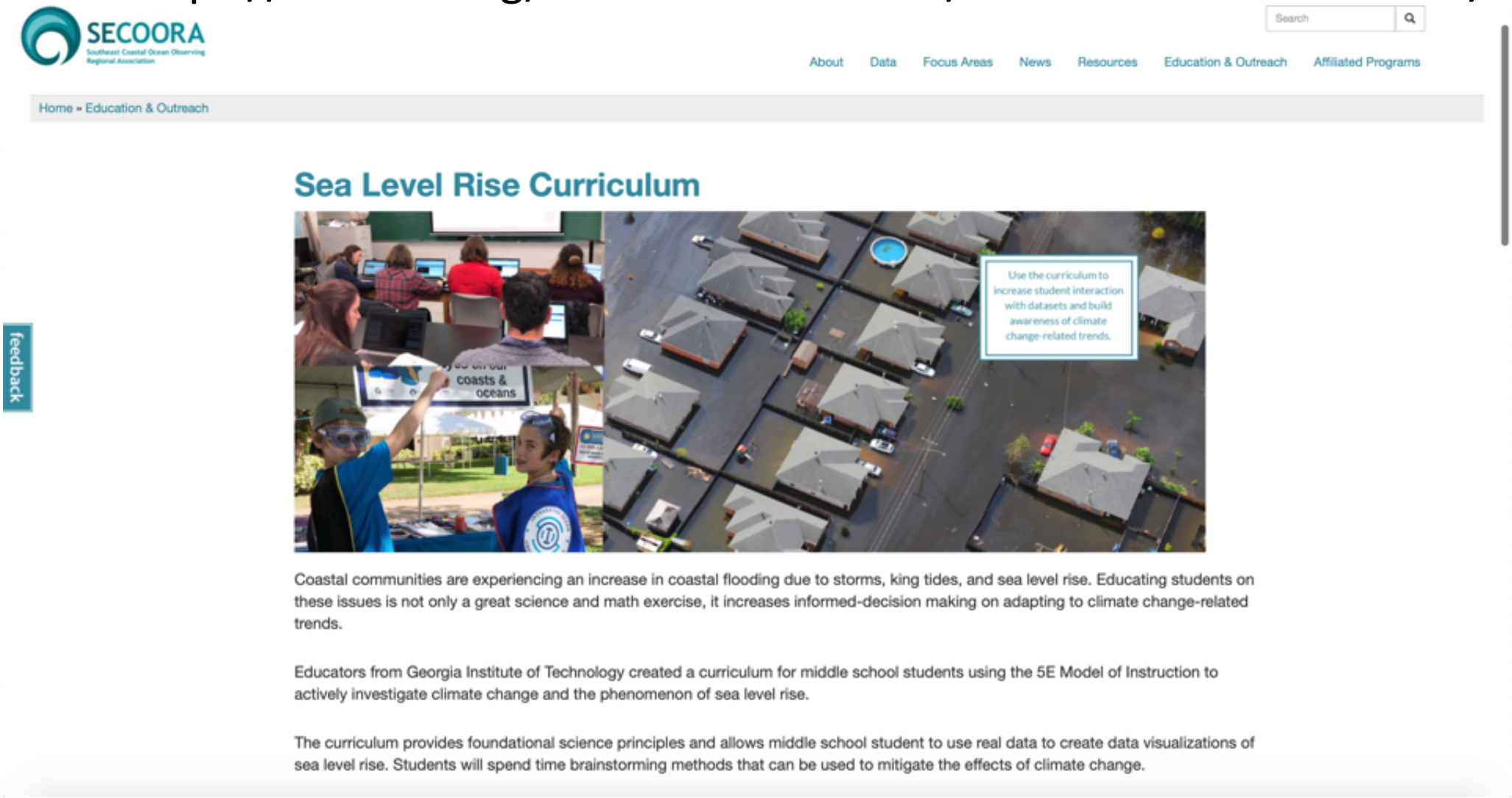
School of Engineering
Herschel V. Jenkins

SMART
SEA LEVEL SENSORS

Middle school curriculum

- developed by Prof. Alex Robel and Jayma Koval (CEISMC)
- webinars for teachers available online at:

https://secoora.org/education-outreach/sea-level-rise-curriculum/



Georgia Tech Global Change Program

globalchange.gatech.edu

Kim Cobb
Director

To empower and equip students to identify, design, and implement solutions to global-scale problems

To accelerate Georgia's capacity as an incubator for scaleable climate solutions

President Emeritus Wayne Clough
Honorary Chair

Summary remarks

Low-cost sensors can provide hyper-local data on climate impacts that are an excellent fit for citizen science programs and deep engagement, while enabling a new set of data-driven tools for stakeholders and decision-makers.

Transdisciplinary research is an emerging ”climate solution”, but it requires support from institutions, a sustained commitment from researchers, and a focus on training the next generation (better).